US 20100280965A1

(19) **United States**

(12) **Patent Application Publication**

Vesterinen et al.

(10) **Pub. No.: US 2010/0280965 A1**

(43) **Pub. Date: Nov. 4, 2010**

(54) **METHOD AND APPARATUS FOR INTUITIVE MANAGEMENT OF PRIVACY SETTINGS**

(75) Inventors: **Matti Vesterinen**, Espoo (FI); **Matti Johannes Nelimarkka**, Helsinki (FI); **Teemu Harju**, Masala (FI); **Tomi Kulmala**, Helsinki (FI); **Ville Rantala**, Mikkeli (FI)

Correspondence Address:
DITTHAVONG MORI & STEINER, P.C.
918 Prince Street
Alexandria, VA 22314 (US)

(73) Assignee: **Nokia Corporation**, Espoo (FI)

(21) Appl. No.: **12/433,714**

(22) Filed: **Apr. 30, 2009**

Publication Classification

(51) **Int. Cl.**
G06Q 99/00 (2006.01)

(52) **U.S. Cl.** **705/319**; 715/853; 709/204

(57) **ABSTRACT**

An approach is provided for intuitive management of privacy settings, which includes receiving data that indicates a contact radius and an information radius. The contact radius is related to how socially close a contact is to a user who is registered with a network service. The information radius is related to how private the information about the user is. In response to a request from the contact for information about the user, information about the user is provided, which has an information radius value in a range that is based on a value of the contact radius associated with the contact.

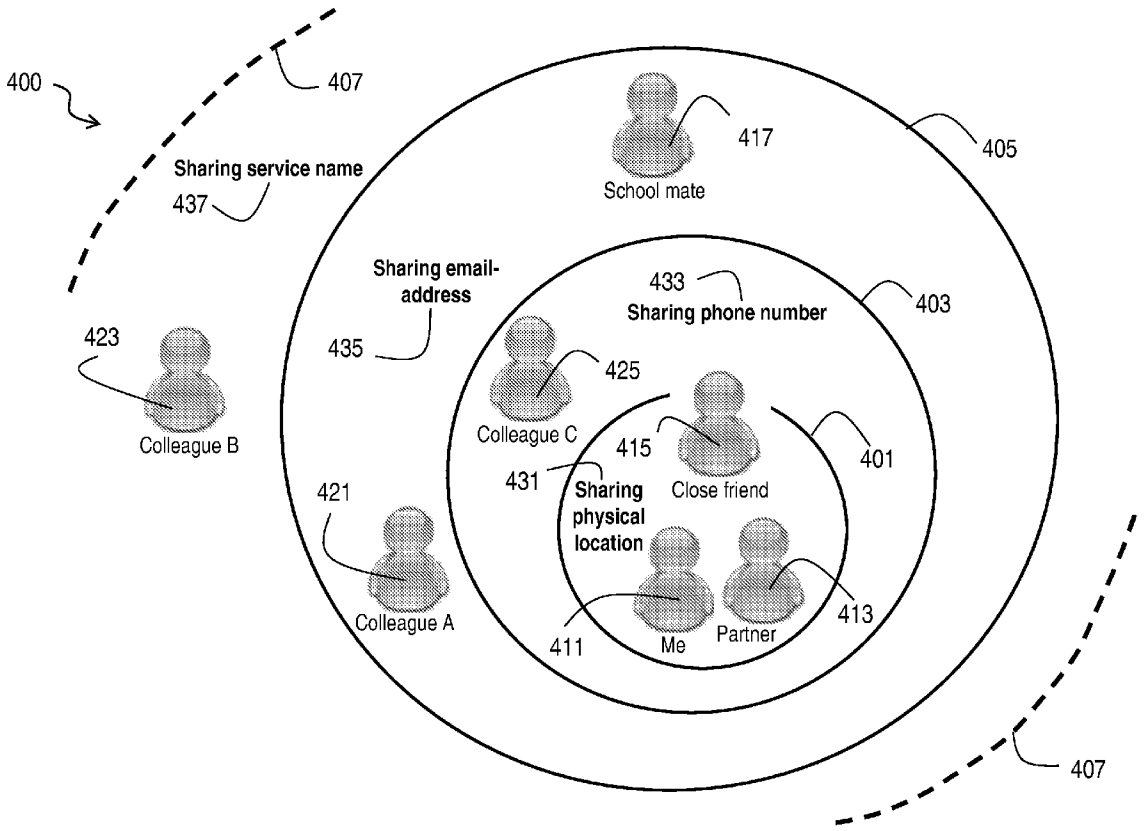


FIG. 1

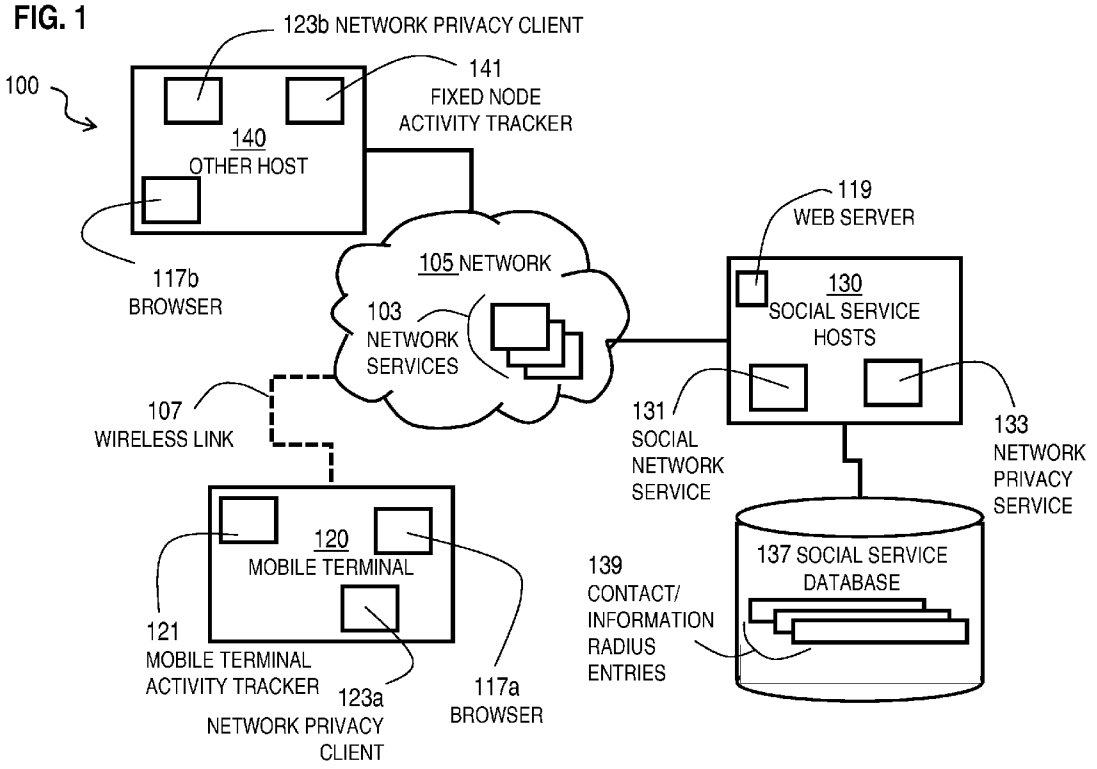

123b NETWORK PRIVACY CLIENT
100
141
FIXED NODE
ACTIVITY TRACKER
140
OTHER HOST
117b
BROWSER
105 NETWORK
103
NETWORK
SERVICES
119
WEB SERVER
130
SOCIAL SERVICE
HOSTS
107
WIRELESS LINK
131
SOCIAL
NETWORK
SERVICE
133
NETWORK
PRIVACY
SERVICE
120
MOBILE TERMINAL
137 SOCIAL SERVICE
DATABASE
139
CONTACT/
INFORMATION
RADIUS
ENTRIES
121
MOBILE TERMINAL
ACTIVITY TRACKER
123a
NETWORK PRIVACY
CLIENT
117a
BROWSER

FIG. 2

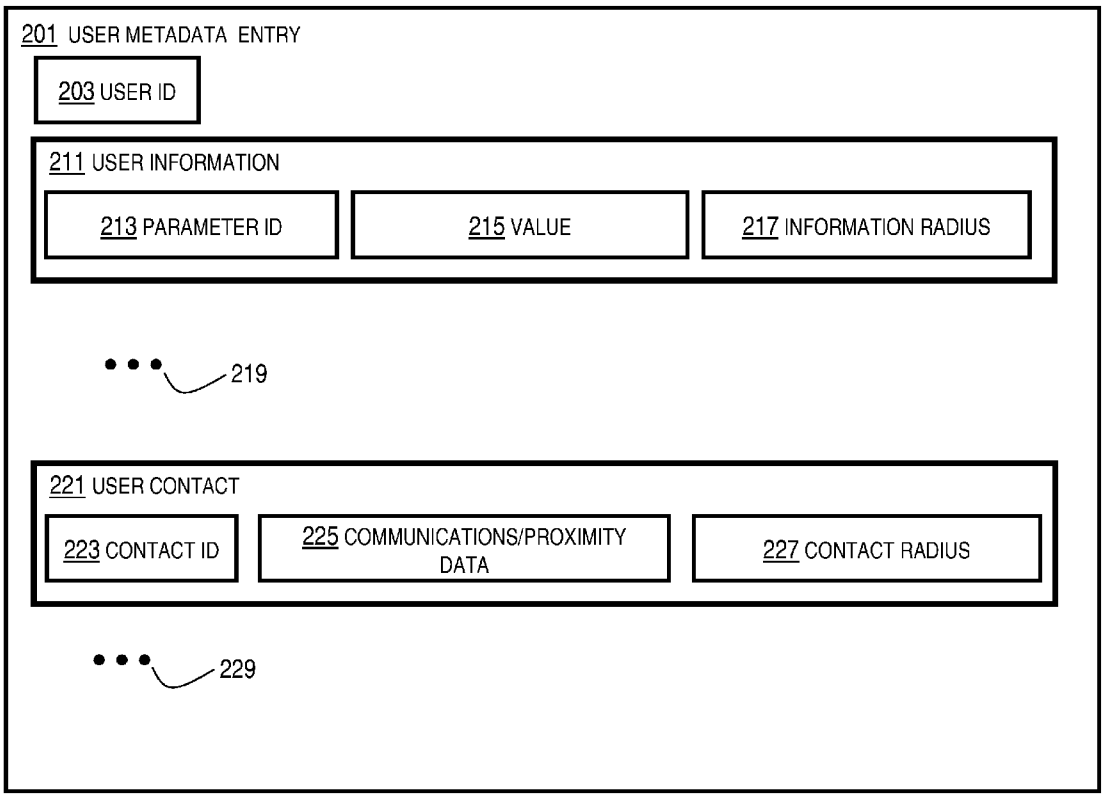

201 USER METADATA ENTRY
203 USER ID
211 USER INFORMATION
213 PARAMETER ID
215 VALUE
217 INFORMATION RADIUS
219
221 USER CONTACT
223 CONTACT ID
225 COMMUNICATIONS/PROXIMITY DATA
227 CONTACT RADIUS
229

FIG. 3

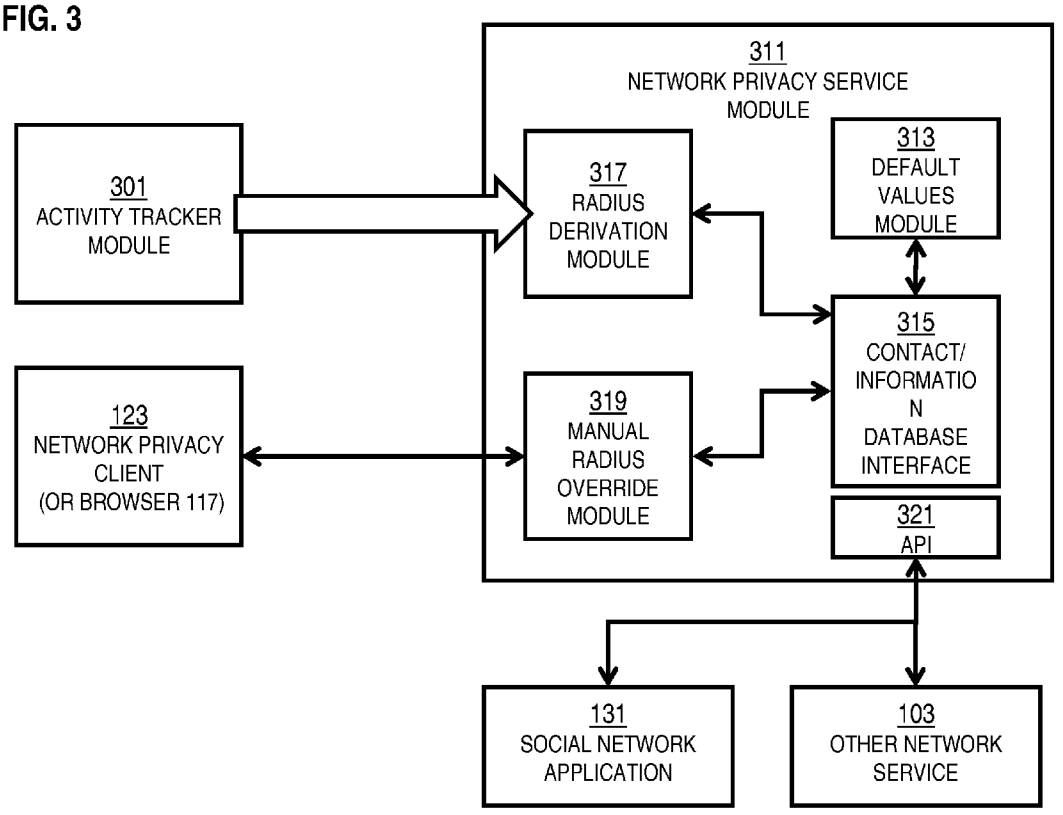

311
NETWORK PRIVACY SERVICE MODULE
301
ACTIVITY TRACKER MODULE
317
RADIUS DERIVATION MODULE
313
DEFAULT VALUES MODULE
315
CONTACT/ INFORMATIO N DATABASE INTERFACE
123
NETWORK PRIVACY CLIENT (OR BROWSER 117)
319
MANUAL RADIUS OVERRIDE MODULE
321
API
131
SOCIAL NETWORK APPLICATION
103
OTHER NETWORK SERVICE

FIG. 4

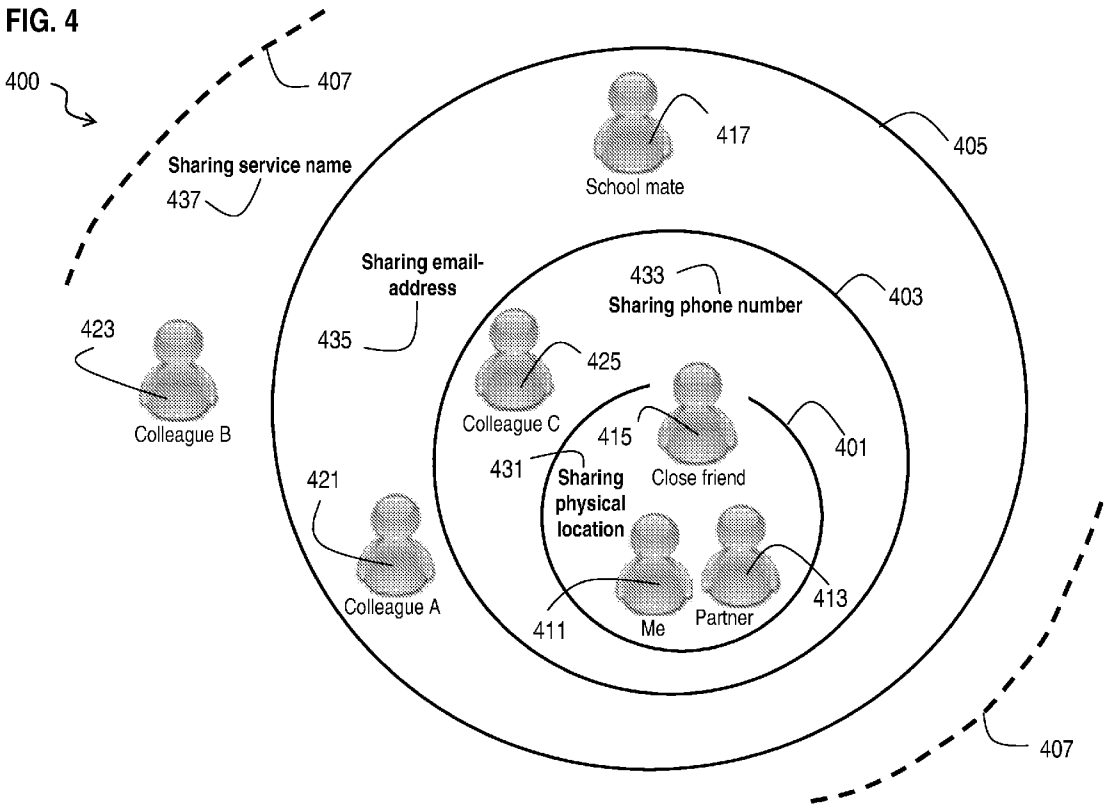

400
407
Sharing service name
437
423
Colleague B
417
School mate
405
Sharing email-address
435
433
Sharing phone number
403
425
Colleague C
415
401
431
Sharing physical location
Close friend
421
Colleague A
411
Me
Partner
413
407

FIG. 5

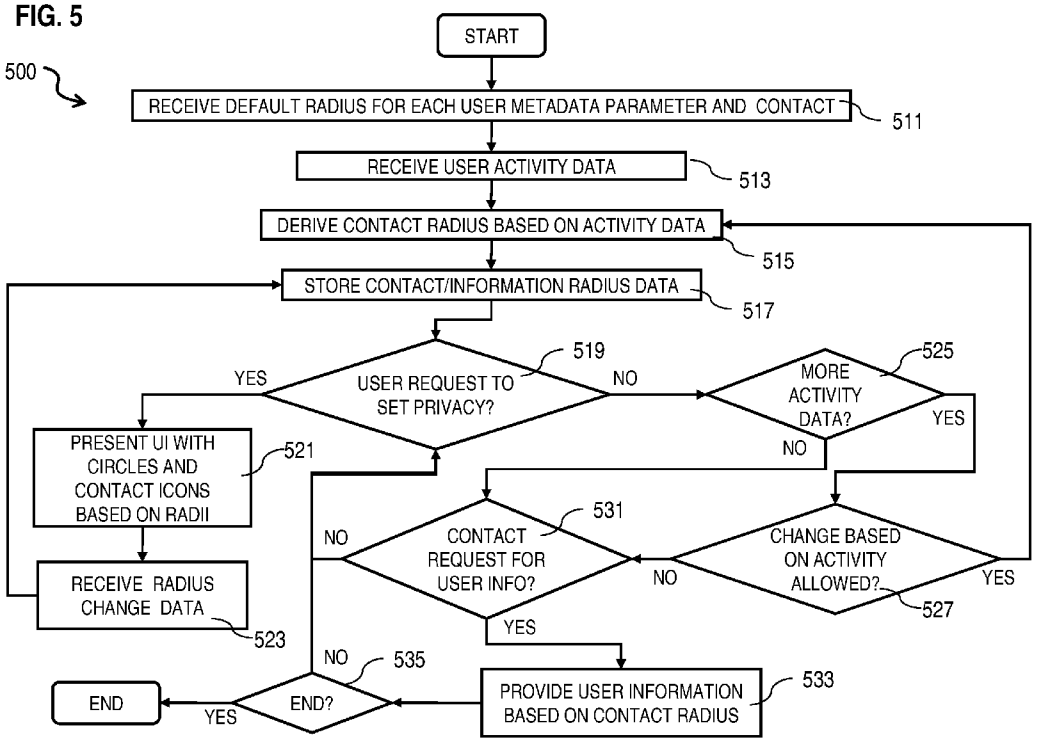

500
START
RECEIVE DEFAULT RADIUS FOR EACH USER METADATA PARAMETER AND CONTACT
511
RECEIVE USER ACTIVITY DATA
513
DERIVE CONTACT RADIUS BASED ON ACTIVITY DATA
515
STORE CONTACT/INFORMATION RADIUS DATA
517
USER REQUEST TO SET PRIVACY?
519
YES
NO
PRESENT UI WITH CIRCLES AND CONTACT ICONS BASED ON RADII
521
RECEIVE RADIUS CHANGE DATA
523
MORE ACTIVITY DATA?
525
YES
NO
CONTACT REQUEST FOR USER INFO?
531
NO
YES
CHANGE BASED ON ACTIVITY ALLOWED?
527
NO
YES
PROVIDE USER INFORMATION BASED ON CONTACT RADIUS
533
END?
535
NO
YES
END

FIG. 6

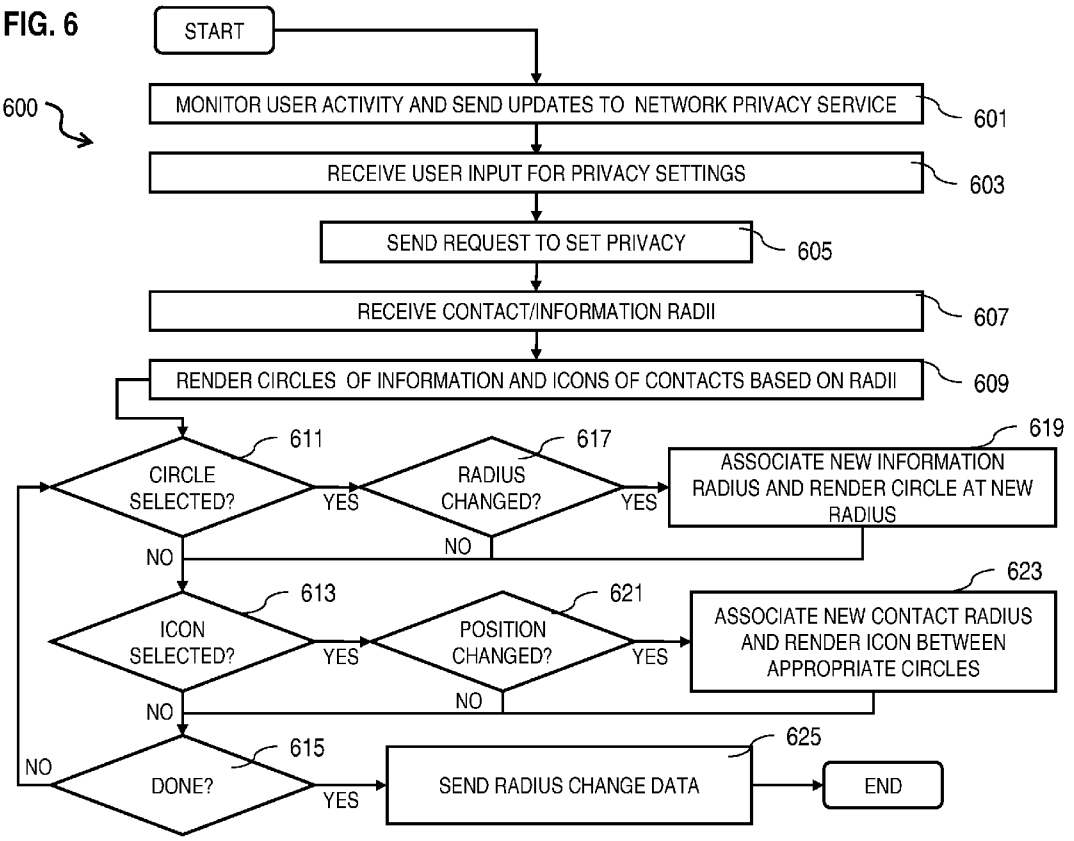

START
600
MONITOR USER ACTIVITY AND SEND UPDATES TO NETWORK PRIVACY SERVICE
601
RECEIVE USER INPUT FOR PRIVACY SETTINGS
603
SEND REQUEST TO SET PRIVACY
605
RECEIVE CONTACT/INFORMATION RADII
607
RENDER CIRCLES OF INFORMATION AND ICONS OF CONTACTS BASED ON RADII
609
611
CIRCLE SELECTED?
YES
617
RADIUS CHANGED?
YES
619
ASSOCIATE NEW INFORMATION RADIUS AND RENDER CIRCLE AT NEW RADIUS
NO
NO
613
ICON SELECTED?
YES
621
POSITION CHANGED?
YES
623
ASSOCIATE NEW CONTACT RADIUS AND RENDER ICON BETWEEN APPROPRIATE CIRCLES
NO
NO
615
DONE?
YES
625
SEND RADIUS CHANGE DATA
END

FIG. 7

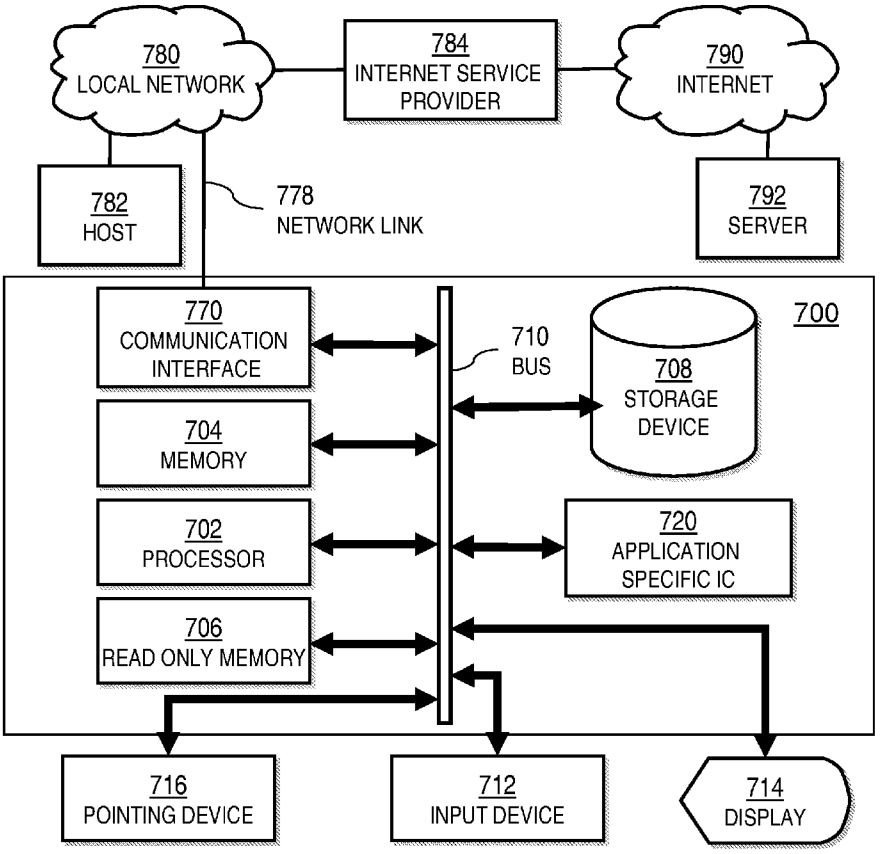

780
LOCAL NETWORK
784
INTERNET SERVICE PROVIDER
790
INTERNET
782
HOST
778
NETWORK LINK
792
SERVER
700
770
COMMUNICATION INTERFACE
710
BUS
708
STORAGE DEVICE
704
MEMORY
702
PROCESSOR
720
APPLICATION SPECIFIC IC
706
READ ONLY MEMORY
716
POINTING DEVICE
712
INPUT DEVICE
714
DISPLAY

FIG. 8

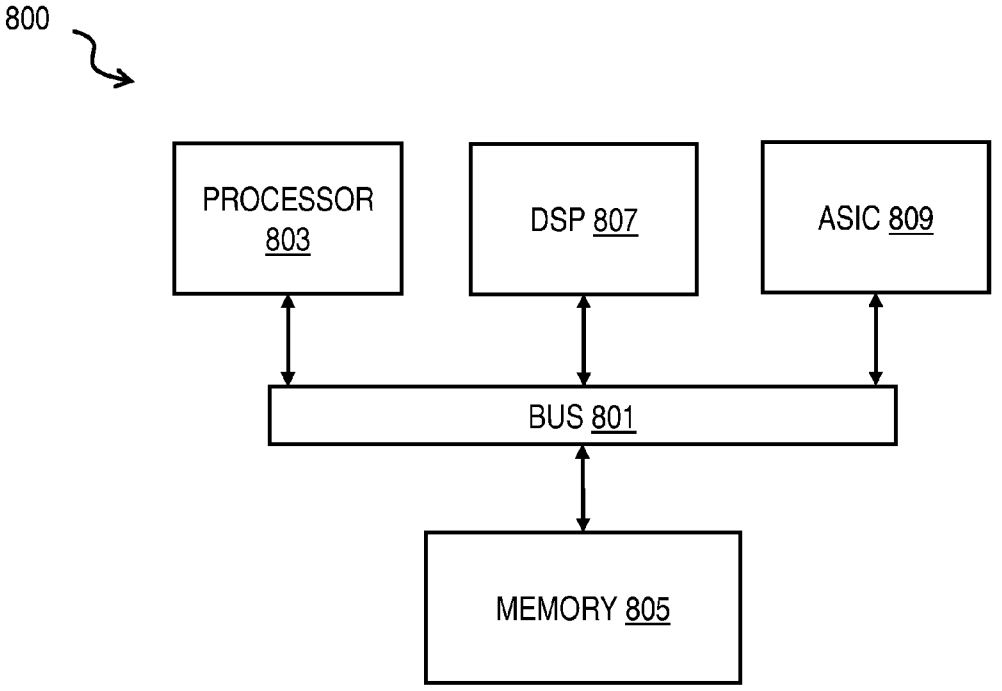
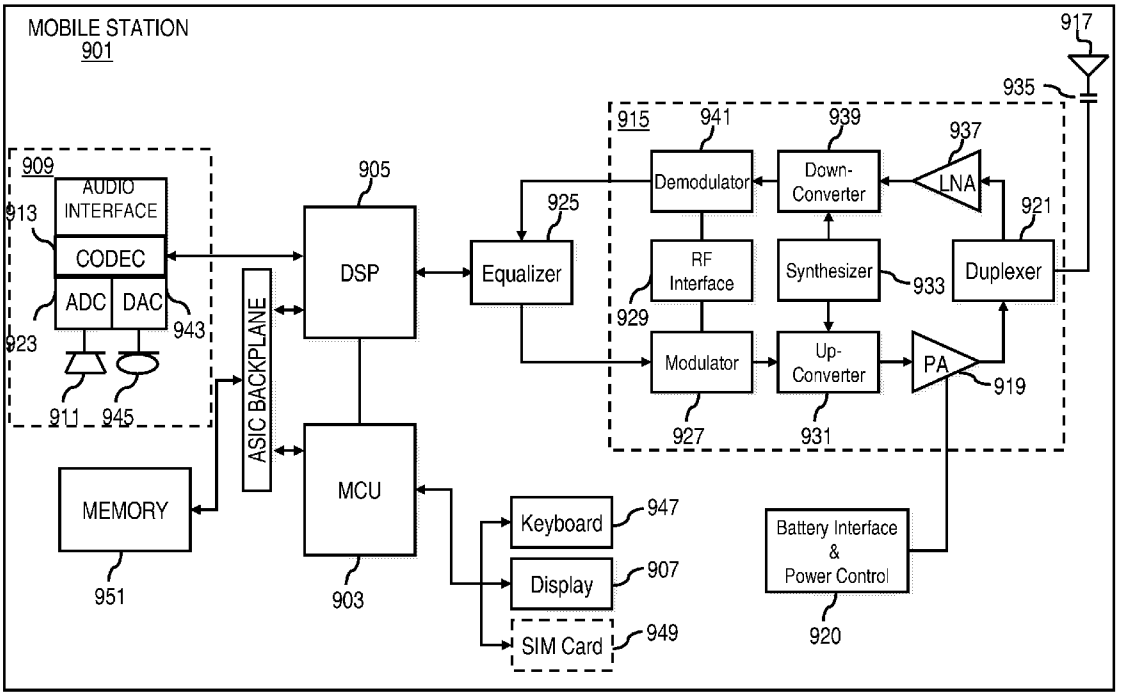


FIG. 9


MOBILE STATION
901
917
935
915
941
939
937
909
905
925
Demodulator
Down-
Converter
LNA
921
AUDIO
INTERFACE
913
DSP
Equalizer
RF
Interface
Synthesizer
933
Duplexer
CODEC
ADC
DAC
943
929
Modulator
Up-
Converter
PA
919
923
911
945
927
931
ASIC BACKPLANE
MEMORY
MCU
Keyboard
947
Battery Interface
&
Power Control
Display
907
SIM Card
949
951
903
920

METHOD AND APPARATUS FOR INTUITIVE MANAGEMENT OF PRIVACY SETTINGS

BACKGROUND

[0001] There are a wide variety of social networking sites available over the Internet. These sites allow subscribers to define some level of privacy settings to control what information the subscriber is sharing with other subscribers. However, the available settings define a rather course division of subscribers into groups, such as one group for those that the subscribers have mutually identified as friends, another group for friends of friends at one or more levels of separation, another group for non-friend subscribers on one or more a regional networks, and a last group of non-friend subscribers in the entire social network. The subscriber's personal information is also divided into categories. The privacy settings allow an individual subscriber (a user) to assign to groups of the other subscribers access for the categories of information. While default assignments are often provided, it is tedious and difficult for the user to change all the defaults and manage the changed setting thereafter. Furthermore, it is not possible for the user to differentiate the information among other subscribers who fall within one of the groups of subscribers. For example, the user might not want to share the same information with all subscribers who are in the friends group, but rather might want to share some information with close friends; while withholding that information from friends who are less close and acquaintances who both happen to be in the friends group.

Some Example Embodiments

[0002] Therefore, there is a need for a less tedious, more intuitive way to manage the private information shared among other subscribers than is currently available in social networks.

[0003] According to one embodiment, a computer-readable storage medium carries instructions which, when executed by a processor, cause the one or more processors to at least perform receiving data that indicates a contact radius and an information radius. The contact radius is related to how socially close a contact is to a user who is registered with a network service. The information radius is related to how private is information about the user. In response to a request from the contact for information about the user, information about the user is provided, which has an information radius value in a range that is based on a value of the contact radius associated with the contact.

[0004] According to another embodiment, an apparatus comprises a processor and a memory storing executable instructions that if executed cause the apparatus to receive data that indicates a contact radius and an information radius. The contact radius is related to how socially close a contact is to a user who is registered with a network service. The information radius is related to how private the information about the user is. In response to a request from the contact for information about the user, the processor and memory are also configured to provide information about the user, which has an information radius value in a range that is based on a value of the contact radius associated with the contact.

[0005] According to another embodiment, an apparatus comprises a means for receiving data that indicates a contact radius and an information radius. The contact radius is related to how socially close a contact is to a user who is registered with a network service. The information radius is related to how private the information about the user is. The apparatus includes a means for providing information about the user, in response to a request from the contact for information about the user. The provided information has an information radius value in a range that is based on a value of the contact radius associated with the contact.

[0006] According to another embodiment, a method includes receiving data that indicates a contact radius and an information radius. The contact radius is related to how socially close a contact is to a user who is registered with a network service. The information radius is related to how private the information about the user is. In response to a request from the contact for information about the user, information about the user is provided, which has an information radius value in a range that is based on a value of the contact radius associated with the contact.

[0007] According to another embodiment, a method includes providing access to receive a request from a contact for information about a user who is registered with a network service. The method includes transferring information about the user, in response to receiving the request. The transferred information has an information radius value in a range that is based on a value of a contact radius associated with the contact. The contact radius is related to how socially close the contact is to the user. The information radius is related to how private the information about the user is.

[0008] Still other aspects, features, and advantages of the invention are readily apparent from the following detailed description, simply by illustrating a number of particular embodiments and implementations, including the best mode contemplated for carrying out the invention. The invention is also capable of other and different embodiments, and its several details can be modified in various obvious respects, all without departing from the spirit and scope of the invention. Accordingly, the drawings and description are to be regarded as illustrative in nature, and not as restrictive.

BRIEF DESCRIPTION OF THE DRAWINGS

[0009] The embodiments of the invention are illustrated by way of example, and not by way of limitation, in the figures of the accompanying drawings, in which:

[0010] FIG. **1** is a diagram of a system for managing information privacy settings, according to one embodiment;

[0011] FIG. **2** is a diagram of a user metadata entry, according to one embodiment;

[0012] FIG. **3** is a diagram of components of a network privacy service module, according to one embodiment;

[0013] FIG. **4** is a diagram of a graphical user interface for managing information privacy, according to one embodiment;

[0014] FIG. **5** is a flow diagram of a method at a server for managing information privacy, according to one embodiment;

[0015] FIG. **6** is a flow diagram of a method at a user node for managing information privacy, according to one embodiment;

[0016] FIG. **7** is a diagram of hardware that can be used to implement an embodiment of the invention;

[0017] FIG. **8** is a diagram of a chip set that can be used to implement an embodiment of the invention; and

[0018] FIG. **9** is a diagram of a terminal that can be used to implement an embodiment of the invention.

DETAILED DESCRIPTION OF EXAMPLE EMBODIMENTS

[0019] A method, apparatus, and software are disclosed for intuitive management of privacy settings. In the following description, for the purposes of explanation, numerous specific details are set forth in order to provide a thorough understanding of the embodiments of the invention. It is apparent, however, to one skilled in the art that the embodiments of the invention may be practiced without these specific details or with an equivalent arrangement. In other instances, well-known structures and devices are shown in block diagram form in order to avoid unnecessarily obscuring the embodiments of the invention.

[0020] Although several embodiments of the invention are discussed with respect to information gathered at a mobile terminal with a wide arrangement of data gathering mechanisms for a user of a single social network, embodiments of the invention are not limited to this context. It is explicitly anticipated that in some embodiments the user is operating at a fixed terminal with many fewer data gathering mechanisms or at different times on one or more of multiple devices of mixed data gathering capability and mobility, as a subscriber to one or more network services that might or might not be classified as social network services.

[0021] FIG. **1** is a diagram of a system **100** for managing information privacy settings, according to one embodiment. The system includes network **105** and network nodes identified as mobile terminal **120**, social service hosts **130** and other host **140**.

[0022] In various embodiments, nodes **120**, **130**, **140** can be any type of fixed terminal, mobile terminal, or portable terminal including desktop computers, laptop computers, handsets, stations, units, devices, multimedia tablets, Internet nodes, communicators, Personal Digital Assistants (PDAs), mobile phones, mobile communication devices, audio/video players, digital cameras/camcorders, televisions, digital video recorders, game devices, positioning devices, or any combination thereof. Moreover, the nodes may have a hard-wired energy source (e.g., a plug-in power adapter), a limited energy source (e.g., a battery), or both. It is further contemplated that the nodes **120**, **130**, **140** can support any type of interface to the user (such as "wearable" circuitry, etc.). In the illustrated embodiment, node **120** is a wireless mobile terminal (also called a mobile station and described in more detail below with reference to FIG. **9**). The mobile terminal **120** is connected to network **105** by a wireless link **107**.

[0023] By way of example, the communication network **105** of system **100** can include one or more wired and/or wireless networks such as a data network (not shown), a wireless network (not shown), a telephony network (not shown), or any combination thereof, each comprised of zero or more nodes. It is contemplated that the data network may be any local area network (LAN), metropolitan area network (MAN), wide area network (WAN), the Internet, or any other suitable packet-switched network, such as a commercially owned, proprietary packet-switched network, e.g., a proprietary cable or fiber-optic network, or any combination thereof. In addition, the wireless network may be, for example, a cellular network and may employ various technologies including code division multiple access (CDMA), wideband code division multiple access (WCDMA), enhanced data rates for global evolution (EDGE), general packet radio service (GPRS), global system for mobile communications (GSM), Internet protocol multimedia subsystem (IMS), universal mobile telecommunications system (UMTS), etc., as well as any other suitable wireless medium, e.g., microwave access (WiMAX), Long Term Evolution (LTE) networks, wireless fidelity (WiFi), satellite, and the like. In various embodiments, communication network **105**, or portions thereof, can support communication using any protocol, for example, the Internet Protocol (IP).

[0024] Information is exchanged between network nodes of system **100** according to one or more of many protocols (including, e.g., known and standardized protocols). In this context, a protocol includes a set of rules defining how the nodes interact with each other based on information sent over the communication links. The protocols are effective at different layers of operation within each node, from generating and receiving physical signals of various types, to selecting a link for transferring those signals, to the format of information indicated by those signals, to identifying which software application executing on a computer system sends or receives the information. The conceptually different layers of protocols for exchanging information over a network are described in the Open Systems Interconnection (OSI) Reference Model. The OSI Reference Model is generally described in more detail in Section 1.1 of the reference book entitled "Interconnections Second Edition," by Radia Perlman, published September 1999.

[0025] The client-server model of computer process interaction is widely known and used. According to the client-server model, a client process sends a message including a request to a server process, and the server process responds by providing a service. The server process may also return a message with a response to the client process. Often the client process and server process execute on different computer devices, called hosts, and communicate via a network using one or more protocols for network communications. The term "server" is conventionally used to refer to the process that provides the service, or the host computer on which the process operates. Similarly, the term "client" is conventionally used to refer to the process that makes the request, or the host computer on which the process operates. As used herein, the terms "client" and "server" refer to the processes, rather than the host computers, unless otherwise clear from the context. In addition, the process performed by a server can be broken up to run as multiple processes on multiple hosts (sometimes called tiers) for reasons that include reliability, scalability, and redundancy, among others. A well known client process available on most nodes connected to a communications network is a World Wide Web client (called a "web browser," or simply "browser") that interacts through messages formatted according to the hypertext transfer protocol (HTTP) with any of a large number of servers called World Wide Web servers that provide web pages. In the illustrated embodiment, mobile terminal **120** and other host **140** include browser **117***a* and browser **117***b*, respectively; and hosts **130** include web server **119**.

[0026] Social service hosts **130** include a social network service module **131** and a network privacy service module **133**, as well as the web server module **119** described above. The different modules depicted on social service hosts **130** may reside at one or more different locations in network **105**. The social network service module **131** provides social networking services that allow multiple subscribers (i.e., regis-

tered users) to share certain types of information. Several social networks are known in the art such as FACEBOOK™ for sharing digital photos and digital text including favorite links to Web pages. NOKIA™ OVI™ is a social network for sharing music, location data and other media that might be gathered or rendered, or both, on a mobile device, such as a cell phone.

[0027] Network privacy service module **133** provides an intuitive way to provide privacy setting for user information at any granularity indicated directly or indirectly by the user. The network privacy service module obtains, for each user, data about the relative privacy of different information about the user and the relative closeness of different persons, called contacts, who come into communication or physical contact with the user. Neither the user nor the contact need be a subscriber to the network privacy service, but might be a subscriber to one or more different network services, such as an email service or a news stream service; and that different service utilizes the network privacy service. Thus as used here, a contact is an entity, such as person or organization or network service with whom the user has communicated, whether that entity is a registered user of a particular social network service or not. In FIG. **1**, other network services **103** are depicted in network **105**.

[0028] According to the illustrated embodiments, both the relative degree of privacy for particular user information and the relative closeness to the user of a contact are represented by numerical values (each called a radius). The relative degree of privacy is called the information radius. The relative closeness of a contact is called the contact radius. In the illustrated embodiments, the information radius and the contact radius are on the same scale. However, in other embodiments, the numerical values used for information radius is on a different scale than the numerical values used for contact radius; and, a scale factor or transform algorithm is used to convert values in one scale to corresponding values in the other scale.

[0029] A contact is provided with user information which has an information radius value in a range that is based on a value of a contact radius associated with the contact. For example, in some embodiments, a contact has access to all user information with an information radius greater than or equal to the contact's contact radius, but not to any information with an information radius less than the contact's contact radius.

[0030] The modules on social service hosts **130** store and retrieve data from one or more social service data structures, such as social service database **137**. In the illustrated embodiment, the social service database includes, for one or more users, entries **139** for contact radius and information radius data (called contact/information radius entries **139**).

[0031] The mobile terminal **120** includes the Web browser **117***a*, described above, a mobile terminal activity tracker module **121**, and a network privacy client module **123***a*. Similarly, the other host **140** includes the Web browser **117***b*, described above, a fixed node activity tracker module **121**, and a network privacy client module **123***b*. The network privacy client modules **123***a*, **123***b*, collectively referenced hereinafter as network privacy client module **123**, interface with a user of the local node and communicate with the network privacy service module **133** to provide the information eventually stored in the contact/information radius entries **139**. In some embodiments, the functions of the network privacy client **123** are accomplished by a combination of standard graphical user interface elements of a web browser **117** in concert with web pages generated for this purpose by web server **119** responding to the network privacy service module **133**. In such embodiments, a separate network privacy client module **123** is omitted.

[0032] In some embodiments, information radii and contact radii for a user of mobile terminal **120** are derived based, at least in part, on user activity on the mobile terminal **120**. As used herein, activity on the mobile terminal includes one or more network communications with each of one or more contacts, or proximity of mobile terminal **120** to the address or mobile location of each of one or more contacts, or some combination. In such embodiments, the mobile terminal **120** includes a mobile terminal activity tracker module **121** that detects those communications and proximity events and reports those activities, or statistical data or radii derived from them, to the network privacy service module **133** over network **105**. Similarly, if the other host **140** is a fixed terminal in such embodiments, then the other host **140** includes a fixed terminal activity tracker module **141** that detects those communications and reports those activities, or statistical data or radii derived from them, to the network privacy service module **133**. The derivation of activity statistics or a radius from activity data is described in more detail below with reference to FIG. **3**

[0033] Although a particular set of nodes, processes, and data structures are shown in FIG. **1** for purposes of illustration, in various other embodiments more or fewer nodes, processes and data structures are involved. Furthermore, although processes and data structures are depicted as particular blocks in a particular arrangement for purposes of illustration, in other embodiments each process or data structure, or portions thereof, may be separated or combined or arranged in some other fashion. For example, in some embodiments, the web server **119** is included in the network privacy service module **133**. In some embodiments, the network privacy service module **133** is included in the social network service module **131**. Likewise, in some embodiments, the mobile terminal activity tracker is included in the network privacy client module **123***a*. In some embodiments, the network privacy client module **123** is a plug in application for the browser **117**. In some embodiments, user input is provided via browser **117** and privacy client **123***a* is omitted.

[0034] FIG. **2** is a diagram of a user metadata entry **201**, according to one embodiment. In this embodiment, the user metadata entry **201** includes contact/information radius entries **139** among the included fields. The included fields are user identification (ID) field **203**, user information field **211** and other user information fields indicated by ellipsis **219**, and user contact field **221** and other user contact fields indicated by ellipsis **229**.

[0035] User ID field **203** holds data that indicates a particular user among all the network users whose privacy settings are managed by the network privacy service **133**. In some embodiments, user ID field **203** holds multiple user IDs, if known, for the same user as that user presents himself or herself to multiple network services **103** and social network service **131**.

[0036] User information field **211** holds data that indicates information about the user that might be shared with one or more other users of network services **103** and social network service module **131** or with the user's contacts who are not registered users. The user information field includes a parameter identifier (ID) field that indicates a particular parameter

of all those used to describe the user and a value field **215** that holds data that indicates a value for the particular parameter. According to the illustrated embodiment, the user information field includes an information radius field **217** that holds data that indicates the relative privacy indicated by the user's actions for the parameter indicated in field **213**. Fields for other parameters used to describe the user are indicated by ellipsis **219**. Example parameters used to describe a user, and stored in one or more user information fields **211** and **219**, are one or more of actual and logon name(s), gender, birthdate, physical address(es), email address(es), political persuasion, religious persuasion, Websites, favorite foods, favorite merchants, favorite books, movies, music and other media, club memberships, and network service(s) to which user subscribes, among other parameters. In some embodiments, the parameter described by a value indicated in value field **215** is implied by the position of the user information field **211** in the user metadata entry **201**, and the parameter field **213** is omitted.

[0037] User contact field **221** holds data that indicates a contact of the user, with whom the user has been in communication or physical proximity or both. The user contact field **221** includes a contact identifier (ID) field **223**, a communications/proximity data field **225**, and a contact radius field **227**. The contact ID field **223** holds data that indicates a particular contact of the user, such as an User ID for that contact, if the contact is also a subscriber to the network service module **133** or one of the network services **103** or **131**, or an email address or a website address.

[0038] The communications/proximity data field **225** holds data that indicates the medium and amount of time the user has been in contact with the entity identified in field **223**, either by communication or by physical proximity. Communication contacts can be determined in any manner known in the art. For example in some embodiments, communication contact is determined by a cell phone capable mobile terminal based on cell phone call number and duration in call logs, and based on text messages (e.g., sent via the short message service, SMS, protocol). Communication contact is determined by most network nodes, whether or not they are mobile terminals, based on number of and language contained in emails, instant messages, visits and text provided to the contact's social page or visits and text on the user's web page by the contact, among others, alone or in some combination. Proximity contacts can be determined in any manner known in the art. For example in some embodiments, proximity contact is determined by a global positioning system (GPS) capable mobile terminal log of position by time, or detection of the contact's wireless short range broadcasts (e.g., Bluetooth signals), or by most fixed network nodes based on an address associated with the user of the fixed terminal, among others, alone or in some combination.

[0039] According to the illustrated embodiment, the user contact field **221** includes a contact radius field **227** that holds data that indicates the relative closeness of the contact to the user as indicated by the user's actions, and possibly also by the contact's actions, as described in more detail below. Fields for other contacts of the user are indicated by ellipsis **229**.

[0040] Although the depicted fields in FIG. **2** are shown as integral blocks of data in a particular order in a single data structure for purposes of illustration, in other embodiments one or more fields, or portions thereof, are arranged in a different order in one or more data structures in one or more databases residing on one or more nodes connected directly or indirectly to network **105**. In some other embodiments, one or more depicted fields or portions thereof are omitted, or additional fields are included.

[0041] FIG. **3** is a diagram of components of a network privacy service module **311**, according to one embodiment. Network privacy service module **311** is a particular embodiment of network privacy service module **133** depicted in FIG. **1**. The network privacy service module **311** interacts with the network privacy client module **123**, the social network application **131**, and other network services **103** depicted in FIG. **1**. The network privacy service module **311** also interacts with an activity tracker module **302**, such as mobile terminal activity tracker module **121** or fixed node activity tracker module **141** depicted in FIG. **1**. In the illustrated embodiment, the network privacy service module **311** includes a default values module **313**, a contact/information database interface **315**, a radius derivation module **317**, manual radius override module **319**, and an application programming interface (API) **321**. Specifications for the API **321** are promulgated to developers of the social network application **131** and other network service **103**, so that those services can request information about a user for a given contact. The API **321** receives any requests from these services and replies with the parameters or values that the specified contact has access to. For example, the module **311** provides through the API data that indicates the user, the contact and the contact radius, in response to a request from a different network service **131** or **103**. Similarly, the API **321** is used by the network privacy service module **311** to request and obtain information from the social network application **131** of other network service **103**, such as the group in which a particular contact of a particular user belongs.

[0042] The default values module **313** produces default contact radius values for a user's contacts and default information radius values for categories of user information. For purposes of illustration, it is assumed that the default information categories and contact groups and associated radii are as indicated in Table. 1. It is further assumed that the information radius and the contact radius use the same scale. It is further assumed that a contact has access to all information about a user with an information radius greater than or equal to the contact's contact radius, but not to any information with an information radius less than the contact's contact radius.

TABLE 1

Example, default radius values for information and contact groups

Information category	Information radius
Physical location	1
Phone number	2
Email address	3
Service name	4
Contacts group	**Contact radius**
Friends	2.5
Friends of friends	3.5
Regional network	3.5
Other contacts	3.5
Others	5

[0043] According to the default values in Table 1, no contact is given access to the user's physical location (e.g., home address or current GPS position) or given access to the user's phone number. The default values allow contacts in a friends

group to access the user's email and service name (e.g., Mike the Marvelous). The default values allow contacts in the friends of friends group, the regional network group, and the other contacts group to access only the user's service name. An entity which does not fall into any of these previous groups, e.g., a person or organization or network service with whom the user has never communicated, falls into the others group and is given access to none of the user's information, not even to the service name.

[0044] The contact/information database interface module **315** is used to store and retrieve data from one or more databases with the contact radius and information radius data for one or more users, such as database **137**. Any database interface may be used. For example, the default values of Table 1 are used to initially fill or update the radius fields **217** and **227** of the user metadata entry **201** for a particular user, UserA. An association of a contact ID with a contact group, and therefore the appropriate contact radius, is determined based on information stored in a field (not shown) in the user contact field **221** or obtained from a social network application **131**, e.g., through API **321**. For purposes of illustration, it is assumed that user A has 6 contacts, 5 of whom are in the friends group, and one of whom is in the other contacts group. After the default settings, the user metadata entry **201** for UserA is shown in Table 2.

TABLE 2

Example metadata entry for user A after default module UserA

Parameter ID	Value	Info radius
Physical location	15.0000N, 15.0000E	1
Phone number	999-555-1234	2
Email address	UserA@serviceprovider.com	3
Service name	Mike the Marvelous	4

Contact ID/name (group)	Communications/ proximity data	Contact radius
413/Partner (Friend)	none	2.5
415/Close.Friend (Friend)	none	2.5
417/School.Mate (Friend)	none	2.5
421/Colleague.A (Friend)	none	2.5
423/Colleague.B (Other Contact)	none	3.5
425/Colleague.C (Friend)	none	2.5

[0045] The radius derivation module **317** receives activity date from the activity tracker module **301** and derives any modifications to the radius values already stored in the database, e.g., database **137**. In some embodiments, the activity data received or statistical summaries of that data are stored by the radius derivation module **317** in the database, e.g., in the communications/proximity data field **225** of the user metadata entry **201**, based on the user and contact or information involved in the activity. Any method may be used to derive a radius that reflects the relative closeness of a contact or the relative privacy of the information parameter from the user's activity involving the user's contact.

[0046] In various embodiments, the radius derivation module determines a radius based on the frequency and duration of communications with a contact, the type of information included in the communications with the contact, the similarity between the metadata of the user and the metadata of the contact, the similarity of the metadata of the contact with the metadata of another contact for whom the user has provided a manual value of the contact radius, and the frequency and duration of physical proximity, among other factors, alone or in any combination. The modified radius value, if any, is then stored in the database in place of the default value. For purposes of illustration it is assumed that the communications/proximity data and revised contact radius stored in the user metadata entry for UserA as a result of operation of the radius derivation module **317** are as shown in Table 3. For purposes of illustration it is assumed that the communications/proximity data field includes four portions separated by slashes in Table 3, which report on: (1) the number of communications; (2) the median proximity; (3) the average duration of a communication; and (4) the frequency of communications, respectively. In other embodiments other data are included in the communications/proximity data field **225**, such as type of information in the communications or occurrence of the specific private user information in a communication with the contact. Thus the one Friends group is further divided to produce a finer granularity of relationships than provided by the default settings or prior approaches.

TABLE 3

Example metadata entry for user A after radius derivation module UserA

Parameter ID	Value	Info radius
Physical location	15.0000N, 15.0000E	1
Phone number	999-555-1234	2
Email address	UserA@serviceprovider.com	3
Service name	Mike the Marvelous	4

Contact ID/name (group)	Communications/proximity data	Contact radius
413/Partner (Friend)	Many/close/long while/every day	0.1
415/Close.Friend (Friend)	Many/close/medium while/often	0.5
417/School.Mate (Friend)	Few/far/long while/rare	2.5
421/Colleague.A (Friend)	Few/close/short while/rare	2.5
423/Colleague.B (Other Contact)	Few/not close/short while/rare	3.5
425/Colleague.C (Friend)	Many/close/short/average	1.5

[0047] The manual radius override module **319** sends the current privacy setting for presentation to the user, e.g., by generating a web page in response to a web page request form a browser **117**, or by sending a message in response to a request from a special purpose network privacy client module **123**. The manual radius override module **319** receives data indicating any user changes to the information radius or contact radius and stores the result in the database through the contact/information database interface **315**. In some embodiments, the presentation of the information and contact radius to the user is a graphical user interface that maps icons representing the contacts into circles representing the different degrees of privacy of the user information.

[0048] FIG. **4** is a diagram of a graphical user interface **400** for intuitively managing information privacy, according to one embodiment. The graphical user interface **400** includes nested circles to represent the different information radii for the user. Circles are nested when the circle with the smaller radius lies entirely within a circle with a larger radius. In some embodiments, the nested circles are concentric. For example, in FIG. **4**, the four radii 1, 2, 3 and 4 for the four pieces of user information in the example: (physical location, phone number, email address and service name, respectively), are shown by the four nested circles, circle **401**, circle **403**, circle **405** and circle **407**, respectively. In some embodiments, the infor-

mation associated with each circle is indicated by a label giving the name of the parameter shared in that circle, e.g., label **431**, label **433**, label **435** and label **437** for circle **401**, circle **403**, circle **405**, and circle **407**, respectively.

[0049] The graphical user interface **400** also includes an icon (such as a default graphical figure, a photo image or avatar) to represent each contact of the user. In the illustrated embodiment, the icon includes a name for the contact. Each icon is positioned inside the innermost nested circle with a radius greater than or equal to the contact radius of that contact. Each contact is granted access to the information associated with all the circles the icon associated with the contact is inside. The user is implicitly in the innermost circle and in some embodiments the user is also represented by an icon, e.g., icon **411** representing UserA, labeled "Me" in FIG. **4**. For example, each of UserA's contacts' icons, labeled by the contact ID number, is placed in the proper circle. The icons can be moved around to avoid obscuring each other as long as they are based in the correct annular or circular area. Thus, the user can readily and intuitively determine what information is granted to which contacts. In embodiments with concentric circles, each icon is simply plotted at a distance equal to that icon's corresponding contact radius from the shared center of the circles. To avoid obscuring icons with equal or similar radii, each icon can be plotted at its radius from the center but at a different angle.

[0050] For example, contact icon **413** (Partner) and contact icon **415** (Close Friend) with contact radii 0.1 and 0.5, respectively (both less than 1.0), are in the innermost circle with information radius 1, representing access to the UserA's physical location. These contacts also have access to the information represented by the outer circles **403**, **405** and **407**. Similarly, contact **425** (Colleague C), with contact radius 1.5, lies outside the innermost circle **401** with information radius 1 and inside the second circle **403**, with radius 2, which represents access to UserA's phone number. This contact is denied access to UserA's physical location in the circle with a smaller radius, but is granted access to UserA's phone number and information represented by the outer circles **405** and **407**. Contact **417** (School Mate) and contact **421** (Colleague A) with contact radii of 2.5, lie outside the second circle **403** with information radius 2 and inside the third circle **405**, with radius 3, which represents access to UserA's email address. These contacts are denied access to UserA's physical location and phone number in the circles with smaller radii, but are granted access to UserA's email address and information represented by the outer circle **407**. Contact **423** (Colleague B), with contact radius 3.5, lies outside the third circle **405** with information radius 3 and inside the fourth circle **407**, with radius 4, which represents access to UserA's service name. This contact is denied access to UserA's physical location, phone number and email address in the circles with smaller radii, but is granted access to UserA's service name.

[0051] In some embodiments, the user can intuitively provide manual input to change the privacy settings by changing a circle's radius, or moving an icon to a different position among the circles, or both. For example, the user can operate a pointing device to place a cursor on a circle to select the circle and then drag the curser to change the radius of that circle to encompass more or fewer icons or to change the relative privacy. For example, to make the phone number less private than the email address, the user can drag circle **405** to give it a smaller radius, and then drag circle **403** to give it a bigger radius, until it is outside circle **405**. Alternatively, the user can activate a button graphical element (not shown) to add a new circle and select a new parameter ID (e.g., from a pull down menu, not shown) to associate with the new circle.

[0052] Similarly, the user can change the innermost circle associated with a contact by using a pointing device to place a cursor on the icon to select the icon, and then drag the curser to change the position of the icon. The icon is given a new radius to comport with the values of the two circles the moved icon now lies between, and any other icon that lies closer or father from the center of the destination circle. Alternatively, the user can activate a button graphical element (not shown) to add a new icon and select a new contact ID (e.g., from a pull down menu, not shown) to associate with the new icon.

[0053] Although FIG. **4** depicts all icons as identical for purposes of illustration, in other embodiments the icons of different contacts may be different. For example, the icon is an image of the individual in some embodiments; or a different icon is used for each group of individuals in other embodiments. It is the position of the icon, not the shape of the icon, that indicates the access to private information in the illustrated embodiments.

[0054] FIG. **5** is a flow diagram of a method **500** at a server for managing information privacy, according to one embodiment. Although steps in FIG. **5** and subsequent flow chart FIG. **6** are shown in a particular order for purposes of illustration, in other embodiments, one or more steps may be performed in a different order or overlapping in time, in series or in parallel, or one or more steps may be omitted or added, or changed in some combination of ways.

[0055] In step **501**, a default information radius is received for each user metadata parameter and a default contact radius is received for each contact of the user. Any method may be used to receive this data. For example, in various embodiments, the data is included as a default value in software instructions, is received as manual input from a network service administrator on the local or a remote node, is retrieved from a local file or database, or is sent from a different node on the network, either in response to a query or unsolicited, or the data is received using some combination of these methods. In an illustrated embodiment, step **501** is accomplished by the default values module **313**.

[0056] In step **513**, user activity data is received, e.g., from activity tracker module **301**, as described above with reference to the activity tracker module **301**. In step **515**, a contact radius or information radius is derived from the activity data as described above with reference to the radius derivation module **317**. In some embodiments without a radius derivation module **317**, step **513** and step **515** are omitted.

[0057] In step **517**, the contact radius values and information radius values for one or more users are stored, e.g., as a user metadata entries such as entry **201** in database **137**, described above.

[0058] In step **519**, it is determined whether a user request is received to set privacy. If so, then in step **521** the user is presented with a user interface (UI) to make the changes to a contact radius or information radius. For example, a message is sent to a network privacy client **123** or a web page is sent to the browser **117** on the user's device (e.g., mobile terminal **120**) to present the graphical user interface **400**. In step **523**, the radius change data is received, e.g., in an HTTP message from the browser **117** or a message from the network privacy client **123**. The changed radius information is stored in step **517**.

[0059] If, as determined in step **519**, a request to set privacy is not received, then it is determined in step **525** whether activity data is received. If so, then it is determined in step **527** whether change of radius is allowed based on activity. In some embodiments, manually input radius values may not be change based on activity data, so the receipt of activity data for a user who already provided manual radius input in step **523** is not allowed in step **527**. In some embodiments, the user's manual import is considered along with the activity data; and, therefore in such embodiments, adjustments to the radius values are allowed. If a change in radius based on activity data is allowed, then the change or changes are derived in step **515** based on the new activity data received in step **525**.

[0060] If activity data is not received, or radius changes based on received activity data are not allowed, then in step **531** it is determined whether a contact is requesting user information. The request may be directly from the contact or indirectly from a network service the contact subscribes to, e.g., a social network service **131**. In some embodiments, the contact is the network service.

[0061] If no such request is received, then it is determined in step **535** whether to end the process. If so, then the process ends. If not, then the next message is examined to determine whether it is a request to set privacy in step **519** or more activity data in step **525** or a request from a contact for user information in step **531**.

[0062] FIG. **6** is a flow diagram of a method **600** at a user node for managing information privacy, according to one embodiment. The steps of method **600** may be performed by one or more modules on a user node, such as on mobile terminal **120** or other host **140**.

[0063] In step **601**, user activity on the node is monitored to cull data about the communication and proximity of the user with various contacts, as described above for the activity tracker module **301**.

[0064] In step **603**, user input is received indicating a desire for privacy settings, either to review current setting or to change one or more settings. For example, a curser activate operation is detected when a cursor lies over a graphical element representing a privacy setting tab. In step **605**, a request to set privacy is sent, e.g., to the network privacy service module **133** or **311**. In step **607** contact radii and information radii data is received, e.g., in a web page at a browser **117** or in a message to a network privacy client module **123**.

[0065] In step **609** a graphical user interface, such as GUI **400**, is presented to the user by rendering circles at the information radii for the user and rendering icons representing contacts at positions within the innermost circle with a radius greater than the contact radius, as shown in FIG. **4**.

[0066] In step **611**, it is determined whether a circle is selected, e.g., by detecting an activated pointing device while a cursor is positioned near a circle edge or an "add circle" button. If not, then it is determined in step **613** whether an icon is selected, e.g., by detecting an activated pointing device while a cursor is positioned near an icon or an "add contact" button. If not, then it is determined in step **615** whether the process is done, e.g., by detecting an activated pointing device while a cursor is positioned over a "Submit" button. If not, then the checks of step **611**, step **613** or step **615** are repeated.

[0067] If it is determined that a circle is selected in step **611**, then it is determined in step **617** whether a circle radius is changed, e.g., by detecting an existing circle being dragged or a new circle being added. If not, then the checks of step **611**, step **613** or step **615** are repeated. If so, then in step **619**, the new radius is associated with the information of the existing or new circle and the circle is rendered at the new radius.

[0068] If it is determined that an icon is selected in step **613**, then it is determined in step **621** whether the icon position is changed, e.g., by detecting an existing icon being dragged or a new icon being added. If not, then the checks of step **611**, step **613** or step **615** are repeated. If so, then in step **623**, a new contact radius based on the position is associated with the contact of the existing or new icon; and, the icon is rendered inside the correct one or more circles based on the new radius.

[0069] If it is determined that the process ends in step **615**, e.g., because the new radius data is to be submitted, then in step **625** the radius change data is sent, e.g., to the network privacy service module **133** or **311**. Then the process ends.

[0070] The processes described herein for intuitive privacy settings may be implemented via software, hardware (e.g., general processor, Digital Signal Processing (DSP) chip, an Application Specific Integrated Circuit (ASIC), Field Programmable Gate Arrays (FPGAs), etc.), firmware or a combination thereof. Such example hardware for performing the described functions is detailed below.

[0071] FIG. **7** illustrates a computer system **700** upon which an embodiment of the invention may be implemented. Computer system **700** includes a communication mechanism such as a bus **710** for passing information between other internal and external components of the computer system **700**. Information (also called data) is represented as a physical expression of a measurable phenomenon, typically electric voltages, but including, in other embodiments, such phenomena as magnetic, electromagnetic, pressure, chemical, biological, molecular, atomic, sub-atomic and quantum interactions. For example, north and south magnetic fields, or a zero and non-zero electric voltage, represent two states (0, 1) of a binary digit (bit). Other phenomena can represent digits of a higher base. A superposition of multiple simultaneous quantum states before measurement represents a quantum bit (qubit). A sequence of one or more digits constitutes digital data that is used to represent a number or code for a character. In some embodiments, information called analog data is represented by a near continuum of measurable values within a particular range.

[0072] A bus **710** includes one or more parallel conductors of information so that information is transferred quickly among devices coupled to the bus **710**. One or more processors **702** for processing information are coupled with the bus **710**.

[0073] A processor **702** performs a set of operations on information. The set of operations include bringing information in from the bus **710** and placing information on the bus **710**. The set of operations also typically include comparing two or more units of information, shifting positions of units of information, and combining two or more units of information, such as by addition or multiplication or logical operations like OR, exclusive OR (XOR), and AND. Each operation of the set of operations that can be performed by the processor is represented to the processor by information called instructions, such as an operation code of one or more digits. A sequence of operations to be executed by the processor **702**, such as a sequence of operation codes, constitute processor instructions, also called computer system instructions or, simply, computer instructions. Processors may be

implemented as mechanical, electrical, magnetic, optical, chemical or quantum components, among others, alone or in combination.

[0074] Computer system **700** also includes a memory **704** coupled to bus **710**. The memory **704**, such as a random access memory (RAM) or other dynamic storage device, stores information including processor instructions. Dynamic memory allows information stored therein to be changed by the computer system **700**. RAM allows a unit of information stored at a location called a memory address to be stored and retrieved independently of information at neighboring addresses. The memory **704** is also used by the processor **702** to store temporary values during execution of processor instructions. The computer system **700** also includes a read only memory (ROM) **706** or other static storage device coupled to the bus **710** for storing static information, including instructions, that is not changed by the computer system **700**. Some memory is composed of volatile storage that loses the information stored thereon when power is lost. Also coupled to bus **710** is a non-volatile (persistent) storage device **708**, such as a magnetic disk, optical disk or flash card, for storing information, including instructions, that persists even when the computer system **700** is turned off or otherwise loses power.

[0075] Information, including instructions, is provided to the bus **710** for use by the processor from an external input device **712**, such as a keyboard containing alphanumeric keys operated by a human user, or a sensor. A sensor detects conditions in its vicinity and transforms those detections into physical expression compatible with the measurable phenomenon used to represent information in computer system **700**. Other external devices coupled to bus **710**, used primarily for interacting with humans, include a display device **714**, such as a cathode ray tube (CRT) or a liquid crystal display (LCD), or plasma screen or printer for presenting text or images, and a pointing device **716**, such as a mouse or a trackball or cursor direction keys, or motion sensor, for controlling a position of a small cursor image presented on the display **714** and issuing commands associated with graphical elements presented on the display **714**. In some embodiments, for example, in embodiments in which the computer system **700** performs all functions automatically without human input, one or more of external input device **712**, display device **714** and pointing device **716** is omitted.

[0076] In the illustrated embodiment, special purpose hardware, such as an application specific integrated circuit (ASIC) **720**, is coupled to bus **710**. The special purpose hardware is configured to perform operations not performed by processor **702** quickly enough for special purposes. Examples of application specific ICs include graphics accelerator cards for generating images for display **714**, cryptographic boards for encrypting and decrypting messages sent over a network, speech recognition, and interfaces to special external devices, such as robotic arms and medical scanning equipment that repeatedly perform some complex sequence of operations that are more efficiently implemented in hardware.

[0077] Computer system **700** also includes one or more instances of a communications interface **770** coupled to bus **710**. Communication interface **770** provides a one-way or two-way communication coupling to a variety of external devices that operate with their own processors, such as printers, scanners and external disks. In general the coupling is with a network link **778** that is connected to a local network **780** to which a variety of external devices with their own processors are connected. For example, communication interface **770** may be a parallel port or a serial port or a universal serial bus (USB) port on a personal computer. In some embodiments, communications interface **770** is an integrated services digital network (ISDN) card or a digital subscriber line (DSL) card or a telephone modem that provides an information communication connection to a corresponding type of telephone line. In some embodiments, a communication interface **770** is a cable modem that converts signals on bus **710** into signals for a communication connection over a coaxial cable or into optical signals for a communication connection over a fiber optic cable. As another example, communications interface **770** may be a local area network (LAN) card to provide a data communication connection to a compatible LAN, such as Ethernet. Wireless links may also be implemented. For wireless links, the communications interface **770** sends or receives or both sends and receives electrical, acoustic or electromagnetic signals, including infrared and optical signals, that carry information streams, such as digital data. For example, in wireless handheld devices, such as mobile telephones like cell phones, the communications interface **770** includes a radio band electromagnetic transmitter and receiver called a radio transceiver.

[0078] The term computer-readable medium is used herein to refer to any medium that participates in providing information to processor **702**, including instructions for execution. Such a medium may take many forms, including, but not limited to, non-volatile media, volatile media and transmission media. Non-volatile media include, for example, optical or magnetic disks, such as storage device **708**. Volatile media include, for example, dynamic memory **704**. Transmission media include, for example, coaxial cables, copper wire, fiber optic cables, and carrier waves that travel through space without wires or cables, such as acoustic waves and electromagnetic waves, including radio, optical and infrared waves. Signals include man-made transient variations in amplitude, frequency, phase, polarization or other physical properties transmitted through the transmission media.

[0079] Common forms of computer-readable media include, for example, a floppy disk, a flexible disk, a hard disk, a magnetic tape, or any other magnetic medium, a compact disk ROM (CD-ROM), a digital video disk (DVD) or any other optical medium, punch cards, paper tape, or any other physical medium with patterns of holes, a RAM, a programmable ROM (PROM), an erasable PROM (EPROM), a FLASH-EPROM, or any other memory chip or cartridge, a transmission medium such as a cable or carrier wave, or any other medium from which a computer can read. Information read by a computer from computer-readable media are variations in physical expression of a measurable phenomenon on the computer readable medium. Computer-readable storage medium is a subset of computer-readable medium which excludes transmission media that carry transient man-made signals.

[0080] Logic encoded in one or more tangible media includes one or both of processor instructions on a computer-readable storage media and special purpose hardware, such as ASIC **720**.

[0081] Network link **778** typically provides information communication using transmission media through one or more networks to other devices that use or process the information. For example, network link **778** may provide a connection through local network **780** to a host computer **782** or to equipment **784** operated by an Internet Service Provider

(ISP). ISP equipment **784** in turn provides data communication services through the public, world-wide packet-switching communication network of networks now commonly referred to as the Internet **790**. A computer called a server host **792** connected to the Internet hosts a process that provides a service in response to information received over the Internet. For example, server host **792** hosts a process that provides information representing video data for presentation at display **714**.

[0082] At least some embodiments of the invention are related to the use of computer system **700** for implementing some or all of the techniques described herein. According to one embodiment of the invention, those techniques are performed by computer system **700** in response to processor **702** executing one or more sequences of one or more processor instructions contained in memory **704**. Such instructions, also called computer instructions, software and program code, may be read into memory **704** from another computer-readable medium such as storage device **708** or network link **778**. Execution of the sequences of instructions contained in memory **704** causes processor **702** to perform one or more of the method steps described herein. In alternative embodiments, hardware, such as ASIC **720**, may be used in place of or in combination with software to implement the invention. Thus, embodiments of the invention are not limited to any specific combination of hardware and software, unless otherwise explicitly stated herein.

[0083] The signals transmitted over network link **778** and other networks through communications interface **770**, carry information to and from computer system **700**. Computer system **700** can send and receive information, including program code, through the networks **780**, **790** among others, through network link **778** and communications interface **770**. In an example using the Internet **790**, a server host **792** transmits program code for a particular application, requested by a message sent from computer **700**, through Internet **790**, ISP equipment **784**, local network **780** and communications interface **770**. The received code may be executed by processor **702** as it is received, or may be stored in memory **704** or in storage device **708** or other non-volatile storage for later execution, or both. In this manner, computer system **700** may obtain application program code in the form of signals on a carrier wave.

[0084] Various forms of computer readable media may be involved in carrying one or more sequence of instructions or data or both to processor **702** for execution. For example, instructions and data may initially be carried on a magnetic disk of a remote computer such as host **782**. The remote computer loads the instructions and data into its dynamic memory and sends the instructions and data over a telephone line using a modem. A modem local to the computer system **700** receives the instructions and data on a telephone line and uses an infra-red transmitter to convert the instructions and data to a signal on an infra-red carrier wave serving as the network link **778**. An infrared detector serving as communications interface **770** receives the instructions and data carried in the infrared signal and places information representing the instructions and data onto bus **710**. Bus **710** carries the information to memory **704** from which processor **702** retrieves and executes the instructions using some of the data sent with the instructions. The instructions and data received in memory **704** may optionally be stored on storage device **708**, either before or after execution by the processor **702**.

[0085] FIG. **8** illustrates a chip set **800** upon which an embodiment of the invention may be implemented. Chip set **800** is programmed to carry out the inventive functions described herein and includes, for instance, the processor and memory components described with respect to FIG. **8** incorporated in one or more physical packages. By way of example, a physical package includes an arrangement of one or more materials, components, and/or wires on a structural assembly (e.g., a baseboard) to provide one or more characteristics such as physical strength, conservation of size, and/or limitation of electrical interaction.

[0086] In one embodiment, the chip set **800** includes a communication mechanism such as a bus **801** for passing information among the components of the chip set **800**. A processor **803** has connectivity to the bus **801** to execute instructions and process information stored in, for example, a memory **805**. The processor **803** may include one or more processing cores with each core configured to perform independently. A multi-core processor enables multiprocessing within a single physical package. Examples of a multi-core processor include two, four, eight, or greater numbers of processing cores. Alternatively or in addition, the processor **803** may include one or more microprocessors configured in tandem via the bus **801** to enable independent execution of instructions, pipelining, and multithreading. The processor **803** may also be accompanied with one or more specialized components to perform certain processing functions and tasks such as one or more digital signal processors (DSP) **807**, or one or more application-specific integrated circuits (ASIC) **809**. A DSP **807** typically is configured to process real-word signals (e.g., sound) in real time independently of the processor **803**. Similarly, an ASIC **809** can be configured to performed specialized functions not easily performed by a general purposed processor. Other specialized components to aid in performing the inventive functions described herein include one or more field programmable gate arrays (FPGA) (not shown), one or more controllers (not shown), or one or more other special-purpose computer chips.

[0087] The processor **803** and accompanying components have connectivity to the memory **805** via the bus **801**. The memory **805** includes both dynamic memory (e.g., RAM, magnetic disk, writable optical disk, etc.) and static memory (e.g., ROM, CD-ROM, etc.) for storing executable instructions that when executed perform the inventive steps described herein. The memory **805** also stores the data associated with or generated by the execution of the inventive steps.

[0088] FIG. **9** is a diagram of example components of a mobile station (e.g., handset) capable of operating in the system of FIG. **1**, according to one embodiment. Generally, a radio receiver is often defined in terms of front-end and back-end characteristics. The front-end of the receiver encompasses all of the Radio Frequency (RF) circuitry whereas the back-end encompasses all of the base-band processing circuitry. Pertinent internal components of the station include a Main Control Unit (MCU) **903**, a Digital Signal Processor (DSP) **905**, and a receiver/transmitter unit including a microphone gain control unit and a speaker gain control unit. A main display unit **907** provides a display to the user in support of various applications and mobile station functions. An audio function circuitry **909** includes a microphone **911** and microphone amplifier that amplifies the speech signal output

from the microphone **911**. The amplified speech signal output from the microphone **911** is fed to a coder/decoder (CODEC) **913**.

[0089] A radio section **915** amplifies power and converts frequency in order to communicate with a base station, which is included in a mobile communication system, via antenna **917**. The power amplifier (PA) **919** and the transmitter/modulation circuitry are operationally responsive to the MCU **903**, with an output from the PA **919** coupled to the duplexer **921** or circulator or antenna switch, as known in the art. The PA **919** also couples to a battery interface and power control unit **920**.

[0090] In use, a user of mobile station **901** speaks into the microphone **911** and his or her voice along with any detected background noise is converted into an analog voltage. The analog voltage is then converted into a digital signal through the Analog to Digital Converter (ADC) **923**. The control unit **903** routes the digital signal into the DSP **905** for processing therein, such as speech encoding, channel encoding, encrypting, and interleaving. In the example embodiment, the processed voice signals are encoded, by units not separately shown, using a cellular transmission protocol such as global evolution (EDGE), general packet radio service (GPRS), global system for mobile communications (GSM), Internet protocol multimedia subsystem (IMS), universal mobile telecommunications system (UMTS), etc., as well as any other suitable wireless medium, e.g., microwave access (WiMAX), Long Term Evolution (LTE) networks, code division multiple access (CDMA), wireless fidelity (WiFi), satellite, and the like.

[0091] The encoded signals are then routed to an equalizer **925** for compensation of any frequency-dependent impairments that occur during transmission though the air such as phase and amplitude distortion. After equalizing the bit stream, the modulator **927** combines the signal with a RF signal generated in the RF interface **929**. The modulator **927** generates a sine wave by way of frequency or phase modulation. In order to prepare the signal for transmission, an up-converter **931** combines the sine wave output from the modulator **927** with another sine wave generated by a synthesizer **933** to achieve the desired frequency of transmission. The signal is then sent through a PA **919** to increase the signal to an appropriate power level. In practical systems, the PA **919** acts as a variable gain amplifier whose gain is controlled by the DSP **905** from information received from a network base station. The signal is then filtered within the duplexer **921** and optionally sent to an antenna coupler **935** to match impedances to provide maximum power transfer. Finally, the signal is transmitted via antenna **917** to a local base station. An automatic gain control (AGC) can be supplied to control the gain of the final stages of the receiver. The signals may be forwarded from there to a remote telephone which may be another cellular telephone, other mobile phone or a land-line connected to a Public Switched Telephone Network (PSTN), or other telephony networks.

[0092] Voice signals transmitted to the mobile station **901** are received via antenna **917** and immediately amplified by a low noise amplifier (LNA) **937**. A down-converter **939** lowers the carrier frequency while the demodulator **941** strips away the RF leaving only a digital bit stream. The signal then goes through the equalizer **925** and is processed by the DSP **905**. A Digital to Analog Converter (DAC) **943** converts the signal and the resulting output is transmitted to the user through the speaker **945**, all under control of a Main Control Unit (MCU) **903**—which can be implemented as a Central Processing Unit (CPU) (not shown).

[0093] The MCU **903** receives various signals including input signals from the keyboard **947**. The MCU **903** delivers a display command and a switch command to the display **907** and to the speech output switching controller, respectively. Further, the MCU **903** exchanges information with the DSP **905** and can access an optionally incorporated SIM card **949** and a memory **951**. In addition, the MCU **903** executes various control functions required of the station. The DSP **905** may, depending upon the implementation, perform any of a variety of conventional digital processing functions on the voice signals. Additionally, DSP **905** determines the background noise level of the local environment from the signals detected by microphone **911** and sets the gain of microphone **911** to a level selected to compensate for the natural tendency of the user of the mobile station **901**.

[0094] The CODEC **913** includes the ADC **923** and DAC **943**. The memory **951** stores various data including call incoming tone data and is capable of storing other data including music data received via, e.g., the global Internet. The software module could reside in RAM memory, flash memory, registers, or any other form of writable storage medium known in the art. The memory device **951** may be, but not limited to, a single memory, CD, DVD, ROM, RAM, EEPROM, optical storage, or any other non-volatile storage medium capable of storing digital data.

[0095] An optionally incorporated SIM card **949** carries, for instance, important information, such as the cellular phone number, the carrier supplying service, subscription details, and security information. The SIM card **949** serves primarily to identify the mobile station **901** on a radio network. The card **949** also contains a memory for storing a personal telephone number registry, text messages, and user specific mobile station settings.

[0096] While the invention has been described in connection with a number of embodiments and implementations, the invention is not so limited but covers various obvious modifications and equivalent arrangements, which fall within the purview of the appended claims. Although features of the invention are expressed in certain combinations among the claims, it is contemplated that these features can be arranged in any combination and order.

What is claimed is:

1. A method comprising:

receiving data that indicates

a contact radius related to how socially close a contact is to a user who is registered with a network service, and

an information radius related to how private is information about the user; and

in response to a request from the contact for information about the user, providing information about the user which has an information radius value in a range that is based on a value of the contact radius associated with the contact.

2. A method of claim **1**, wherein a smaller radius indicates a socially closer contact or more private information, the method further comprising

providing information about the user comprises providing information about the user which has an information radius no less than a contact radius of the contact.

3. A method of claim **1**, further comprising initiating presentation of a graphical user interface that shows:

a plurality of nested circles representing corresponding information radii for a plurality of associated private information about the user; and

a plurality of icons for associated contacts positioned among the plurality of nested circles based on a corresponding plurality of associated contact radii,

wherein each icon of the plurality of icons is inside a circle with a information radius greater than a contact radius associated with the icon and outside a circle with an information radius less than the contact radius.

4. A method of claim **3**, wherein receiving information that indicates a contact radius further comprises receiving user input data that indicates a change in a position of an icon associated with the contact.

5. A method of claim **3**, wherein receiving data that indicates an information radius further comprises receiving user input data that indicates a change in a radius of a circle for the information about the user.

6. A method of claim **1**, wherein receiving data that indicates a contact radius further comprises:

automatically receiving further data that indicates communications between the user and the contact; and

automatically deriving the contact radius based on the further data.

7. A method of claim **1**, wherein receiving data that indicates a contact radius further comprises:

automatically receiving further data that indicates similarity of metadata about the user with metadata about the contact; and

automatically deriving the contact radius based on the further data.

8. A method of claim **1**, wherein receiving data that indicates a contact radius further comprises:

automatically receiving further data that indicates similarity of metadata about the contact with metadata about a different contact; and

automatically deriving the contact radius for the contact based on the further data and a different contact radius for the different contact.

9. A method of claim **1**, wherein receiving data that indicates a contact radius further comprises:

automatically receiving further data that indicates proximity between the user and the contact and duration of proximity; and

automatically deriving the contact radius based on the further data.

10. A method of claim **3**, wherein receiving data that indicates a contact radius further comprises receiving data that indicates a contact radius at a degree of granularity defined by the user.

11. A method of claim **1**, further comprising:

providing data that indicates the user, the contact and the contact radius, in response to a request from a different network service.

12. An apparatus comprising at least one processor and at least one memory including computer program code, the at least one memory and the computer code configured to, with the at least one processor, cause the apparatus to perform at least the following:

receive data that indicates

a contact radius related to how socially close a contact is to a user who is registered with a network service, and

an information radius related to how private is information about the user; and

in response to a request from the contact for information about the user, provide information about the user which has an information radius value in a range that is based on a value of the contact radius associated with the contact.

13. A system including the apparatus of claim **12**, the system further comprising a mobile terminal configured to send at least some of the data.

14. An apparatus of claim **12**, wherein: a smaller radius indicates a socially closer contact or more private information; and, the step to provide information about the user comprises provide information about the user which has an information radius no less than a contact radius of the contact.

15. An apparatus of claim **12**, wherein the apparatus is further caused to initiate presentation of a graphical user interface that shows:

a plurality of nested circles representing corresponding information radii for a plurality of associated private information about the user; and

a plurality of icons for associated contacts positioned among the plurality of nested circles based on a corresponding plurality of associated contact radii,

wherein each icon of the plurality of icons is inside a circle with a information radius greater than a contact radius associated with the icon and outside a circle with an information radius less than the contact radius.

16. An apparatus of claim **15**, wherein the step to receive information that indicates a contact radius further comprises receive user input data that indicates a change in a position of an icon associated with the contact.

17. An apparatus of claim **15**, wherein the step to receive data that indicates an information radius further comprises receiving user input data that indicates a change in a radius of a circle for the information about the user.

18. An apparatus of claim **12**, wherein the step to receive data that indicates a contact radius further comprises:

automatically receive further data that indicates communications between the user and the contact; and

automatically derive the contact radius based on the further data.

19. An apparatus of claim **12**, wherein the apparatus is further caused to provide data that indicates the user, the contact and the contact radius, in response to a request from a different network service.

20. A method comprising:

providing access to receive a request from a contact for information about a user who is registered with a network service,

in response to receiving the request, transferring information about the user which has an information radius value in a range that is based on a value of a contact radius associated with the contact,

wherein

the contact radius is related to how socially close the contact is to the user, and

the information radius is related to how private is the information about the user.

* * * * *